

## TITLE OF THE INVENTION

[0001]

CUP HOLDER WITH SENSOR

## BACKGROUND OF THE INVENTION

[0002] This invention relates to a holder for supporting an article. More particularly, the invention relates to a multi-purpose holder for supporting an article in a vehicle.

[0003] Vehicle interiors typically include a variety of decorative and functional trim panels. For example, the front area of the interior of a vehicle, generally referred to as the cockpit area, includes an instrument panel, typically formed of a molded plastic material. Vehicles also may include a center console located between the driver and passenger seats for storage and placement of various articles. The instrument panel and/or center console can include a variety of devices for holding beverage containers, typically known as cup holders. It is often desirable for vehicle occupants to store other articles or objects in a vehicle such that the articles are within easy reach of the occupant. Known cup holders typically are adapted to hold known beverage containers, such as cans, cups, and bottles, and may be capable of holding other articles, such as wireless telephones. Cup holders capable of holding articles or containers having a variety of sizes are known. However, such cup holders are often difficult to use, particularly with very large and very small containers. It would therefore be advantageous if there could be developed an improved multi-purpose holder for supporting articles and containers having different sizes and shapes in a vehicle.

## BRIEF SUMMARY OF THE INVENTION

[0004] This invention relates to a multi-purpose holder for supporting an article in a vehicle. The multi-purpose holder for supporting an article in a vehicle includes a

support member for supporting an article. The multi-purpose holder further includes a sensor that is adapted to generate a signal that is a function of a desired position of the support member. An actuator is selectively coupled to the support member, the actuator is operable to enable the support member to move in response to the signal. In a preferred embodiment, the multi-purpose holder further includes a body structured and configured to receive the article. In a more preferred embodiment, the body is structured and configured to receive a cup or beverage container.

[0005] Various objects and advantages of this invention will become apparent to those skilled in the art from the following detailed description of the preferred embodiment, when read in light of the accompanying drawings.

#### BRIEF DESCRIPTION OF THE DRAWINGS

[0006] Fig. 1 is a view of the interior of a passenger compartment of a vehicle having a multi-purpose holder assembly according to the present invention.

[0007] Fig. 2 is an enlarged cross-sectional view of the multi-purpose holder assembly of Fig. 1.

[0008] Fig. 3 is an enlarged plan view of a portion of the multi-purpose holder assembly with the arm assembly in a disengaged position of Fig. 2.

[0009] Fig. 4 is an enlarged plan view of a portion of the multi-purpose holder assembly with the arm assembly in an engaged position of Figs. 2 and 3.

[0010] Fig. 5 is an enlarged cross-sectional view of a second embodiment of a multi-purpose holder assembly in accordance with the present invention.

[0011] Fig. 6 is an enlarged cross-sectional view of a third embodiment of a multi-purpose holder assembly in accordance with the present invention.

[0012] Fig. 7 is an enlarged cross-sectional view of a fourth embodiment of a multi-purpose holder assembly in accordance with the present invention.

#### DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

[0013] Referring now to the drawings, there is illustrated in Fig. 1 a portion of an interior passenger compartment of a vehicle, indicated generally at 10. The illustrated vehicle interior passenger compartment 10 is, in large measure, conventional in the art and is intended merely to illustrate one environment in which this invention may be used. Thus, the scope of this invention is not intended to be limited for use with the specific structure for the vehicle interior passenger compartment illustrated in Fig. 1 or with vehicle interior passenger compartments in general. On the contrary, as will become apparent below, this invention may be used in any desired environment for the purposes described below.

[0014] The vehicle interior passenger compartment 10 includes an instrument panel or dashboard 12. Positioned within the instrument panel 12 are various visual gauges for the driver's convenience, and various temperature and climate controls. Other controls, storage compartments and stereo controls may be positioned within the instrument panel 12 or within a lower console 14. The lower console 14 is positioned between a passenger seat 16 and a driver seat 18 and may include a storage compartment 20 that has a lid 22 that can also serve as an armrest. Also located within the passenger compartment is a glove box 24 that may be partially disposed within the instrument panel 12. The storage compartment 20 can be accessed by lifting the armrest lid 22. It will be appreciated that the storage compartment 20 may extend into the back seat area (not shown) of the vehicle interior passenger compartment 10. Alternatively, a second storage compartment (not shown) may be provided in the back seat area (not shown). An overhead console (not shown) can also be accessible from within the interior passenger compartment of the vehicle. The overhead console can contain various controls, such as a garage door opener, climate controls, etc. The overhead console can also contain storage compartments for sunglasses, portable media, or a mobile phone. The vehicle interior passenger compartment 10 may be partially defined by vehicle doors 26.

[0015] Positioned between the driver seat 18 and the passenger seat 16, and connected with the storage compartment 20, there is a second storage compartment or multi-purpose holder assembly 28. However, it will be appreciated that the multi-

purpose holder assembly 28 may be positioned within or a portion of any portion of the vehicle interior passenger compartment 10. For example, the multi-purpose holder assembly 28 may be provided within at least one of the instrument panel 12, the lower console 14, a portion of the driver seat 18, a portion of the passenger seat 16, the compartment 20, the lid 22, the glove box 24, a portion of the vehicle doors 26, or any other portion or several portions of the vehicle interior passenger compartment 10.

[0016] The multi-purpose holder assembly 28 may be used to receive any desired article 30. The article 30 may be any object that is desired to be restrained within the passenger compartment of the vehicle. In a preferred embodiment, the article 30 is a beverage container, as shown in phantom in Figs. 2, and 5 through 9, and described below. It is anticipated that the article 30 may have a generally cylindrical shape (e.g. soda can) or a generally tapered cylindrical shape (e.g. fountain drink or coffee container). However, the article 30 may be any removable item such as a mobile phone, PDA, sunglasses, cigarette box, or portable media, and have any shape. Also, a larger version of the multi-purpose holder assembly 28 can also be implemented in accordance with this invention such that a notebook computer or other larger object can be supported therewith. It will also be appreciated that the article 30 may be a liquid or beverage disposed directly within the multi-purpose holder assembly 28.

[0017] Referring now to Fig. 2, there is an enlarged cross-sectional view of the multi-purpose holder assembly 28 shown in Fig. 1. Although the multi-purpose holder assembly 28 is shown having a generally cylindrical shape, it should be appreciated that the multi-purpose holder assembly 28 could be rectangular, conical, or have any other desired shape.

[0018] The multi-purpose holder assembly 28 includes at least one support member 32 and a sensor 34. An actuator 36 is selectively coupled to the support member 32 such that the actuator 36 is operable to enable the support member 32 to move in response to a signal that is generated by the sensor 34. The multi-purpose holder assembly 28 may also include a body 38 to further define the multi-purpose holder assembly 28 and/or provide support for at least one of the at least one support member 32, the sensor 34, and the article 30, although such is not required. In a preferred

embodiment, the body 38 defines a recess 40 for receiving at least a portion of the article. A controller 42 may be provided that is operably connected to the sensor 34 such that the controller 42 may receive and interpret a signal generated by the sensor 34 that is indicative of a sensed condition. The controller 42 is also operably connected to the actuator 36 such that in response to a sensed condition, the controller 42 may generate a command to the actuator 36 to move the at least one support member 32.

[0019] In Fig. 2, the at least one support member 32 is illustrated as a plurality of arm members. However, it will be appreciated that the at least one support member 32 may be a single member or multiple members, and may be any desired size or shape to provide support to an article placed within the multi-purpose holder 28. Although such is not required, at least a portion of the at least one support member 32 may be a flexible member, such that the at least one support member 32 provides the article 30 flexible, cushioned support to prevent undesirable contact between the article 30 and the at least one support member 32 during operation of the vehicle.

[0020] As illustrated, the at least one support member 32 is pivotably connected to the body 38, although such is not required. It will be appreciated that the at least one support member 32 may be mounted to or supported by any portion of the vehicle interior passenger compartment 10 in any manner. The at least one support member 32 is movable from a first position in which the at least one support member 32 is generally disposed within the body 38. The at least one support member 32 is movable to a second position in which the at least one support member 32 is disposed adjacent the article 30, as shown in phantom in Fig. 2. To move from the first position to the second position, each of the at least one support members 32 may pass through at least one opening or recess 43 formed in the body 38, although such is not required. The at least one support member 32 may provide support for the article 30 and/or prevent undesirable movement of the article 30 when the at least one support member 32 is in at least one of first position and the second position. The at least one support member 32 may be biased toward the first position. The at least one support member 32 may be pivotably movable between the first position and the second position or

may be movable horizontally and/or vertically between the first position and the second position.

[0021] The sensor 34 is adapted to generate a signal that is a function of a desired position of the support member 32. The sensor 34 may also sense at least one condition of the article 30, when the article 30 is placed within the multi-purpose holder assembly 28. The sensor 34 may be any sensor capable of detecting at least one condition of the article 30 and generating a signal representative of that sensed condition or other condition that is a function of the desired position of the support member 32. For example, the sensor 34 may include a non-mechanical or non-movable touch cell or switch, such as, but not limited to, resistive, inductive, piezoelectric and capacitive switches. The sensor 34 may include a non-contact cell or switch, such as a field effect device or an optical sensor, although such is not required. In a preferred embodiment, the sensor 34 may include a field effect cell, such as the Mirus™ detector cells available from the Material Sciences Corporation. The sensed condition may be at least one of the height, the diameter, the width, the perimeter, the weight, and the position of the article 30. The sensed condition may also include the presence of the article 30 within the multi-purpose holder assembly 28 and/or the pressure exerted by the article 30. Further, the sensed condition may include the liquid level within the article 30 or the multi-purpose holder assembly 28. In a preferred embodiment, the sensor 34 includes a field effect sensor device and may be particularly suited to detect the presence or conditions of an article 30 that is at least partially comprised of one of a metal and a liquid. The sensor 34 may be positioned near the body 38 or other portion of the multi-purpose holder assembly 28 or near the at least one support member 32. The sensor 34 may be positioned within or adjacent the multi-purpose holder assembly 28. It will be appreciated that the sensor 34 may be a single sensor device or a plurality of sensors, and each of the plurality of sensors may be capable of detecting at least one of a plurality of conditions and generating respective representative signals thereof.

[0022] The actuator 36 may be selectively coupled to the support member 32 to enable the support member 32 to move in response to the signal generated by the

sensor 34. The actuator 36 may be any actuation device capable of enabling the at least one support member 32 to move. For example, the actuator 36 may include at least one of a gear rack assembly, a cam assembly, and a linear tooth rack, as will be described below. The at least one support member 32 may be movable from the first position to the second position by the actuator 36, and may be movable from the second position back to the first position by a biasing means (not shown), although such is not required. It will be appreciated that the actuator 36 may facilitate the movement of the at least one support member 32 between the first position and the second position and the return movement from the second position to the first position.

[0023] The body 38 is structured and configured to receive at least a portion of the article 30. The body 38 may be formed integral to or may form a portion of an interior trim component or other portion of the vehicle, although such is not required. Preferably, the body 38 defines at least a portion of the recess 40. The recess 40 may be shaped to receive the article 30. The body 38 may additionally define a substantially horizontal support surface 44 for vertically supporting the article 30, although such is not required. It will be appreciated that the article 30 may be supported and/or restrained by the at least one support member 32 such that the multi-purpose holder multi-purpose holder assembly 28 does not require the body 38.

[0024] The controller 42 may be any microprocessor capable of receiving and/or interpreting a signal generated by the sensor 34 and generating a command to the actuator 36 in response to that signal. The controller 42 may be able to calculate or extrapolate additional conditions or characteristics of the article 30 based on the signal received from the sensor 34. For example, the desired position of the support member 32 may be determined as a function of the position or center of gravity of the article 30. The position or center of gravity of the article 30 may be determined as a function of a signal or signals received from the sensor 34 indicating the height, diameter, and/or weight of the article 30. The controller 42 may access a look-up table or other series of stored values to calculate, interpret, or extrapolate conditions of the article 30, the desired position of the support member 32, and/or the required movements of

the actuator 36. It will be appreciated that the controller 42 may receive multiple signals from the sensor 34 or a plurality of sensors and may use a variety of combinations of such signals to calculate at least one condition or characteristic of the article 30 and the corresponding desired position of the actuator 36. In response to the signal received and interpreted and/or the additional conditions calculated for the article 30, the controller 42 generates commands that are sent to actuator 36. The commands sent to the actuator 36 may include commands to control the movement of the actuator 36 such that the actuator 36 moves the at least one support member 32 adjacent the article 30 as determined by the controller 42. The controller 42 may include processing, memory, and storage devices as required to perform the functions described herein.

[0025] As illustrated in Figs. 2, 3, and 4, the actuator 36 includes an actuator plate 46, although such is not required. It will be appreciated that the actuator 36 is illustrative of one device suitable for inducing movement in the at least one support member 32 and that any actuation device may be used to induce movement in the at least one support member 32 in accordance with this invention. Further, if multiple members comprise the at least one support member 32, each of the at least one support members may be actuated independently of one another in accordance with this invention. For example, if the article 30 is not symmetrical in shape or not disposed symmetrically within the multi-purpose holder assembly 28, it may be desirable to position each of the at least one support members 32 in a nonsymmetrical manner to best support the article 30.

[0026] As illustrated, the actuator plate 46 is capable of engaging the at least one support member 32 to induce movement of the at least one support member 32. The actuator plate 46 may be connected to a motor 48 by a gear assembly 50 such that the motor 48 rotationally drives the actuator plate 46. As illustrated, a first portion of the gear assembly 50 is connected to the shaft of the motor 48 and a second portion of the gear assembly 50 is connected to the actuator plate 46. The first and second portions of the gear assembly 50 have correspondingly engageable gear teeth to facilitate the



transfer of rotational movement therebetween to reduce and transfer the rotational drive of the motor 48 to the actuator plate 46.

[0027] The actuator plate 46 includes at least one tang 52 corresponding to each of the at least one support members 32. The actuator plate 46 is rotatably movable from a first position in which each of the at least one tangs 52 is not engaging each respective one of the at least one support members 32, as shown in Fig. 3, to a second position in which each of the at least one tangs 52 engages each respective one of the at least one support members 32 to induce movement in each of the at least one support members 32, as shown in Fig. 4. As illustrated, as each of the at least one tangs 52 engages a respective one of the at least one support members 32 so that each of the at least one support members 32 is pivotably rotated such that a portion of each of the at least one support members 32 is moved adjacent the article 30. It will be appreciated that the actuator plate 46 and the at least one tang 52 may engage and disengage the at least one support member 32 in any manner to facilitate movement of the at least one support member 32 relative to the multi-purpose holder assembly 28 and/or the article 30.

[0028] The operation of the multi-purpose holder assembly 28 will now be described. Prior to the article 30 being placed in the multi-purpose holder assembly 28, the at least one support member 32 is in the first position in which the at least one support member 32 is generally disposed within the body 38 and does not extend into the recess 40. Once the article 30 is placed within the multi-purpose holder assembly 28, preferably within the recess 40, the sensor 34 detects at least one characteristic or condition of the article 30 and transmits a signal indicative of the sensed condition to the controller 42. The controller 42 receives and/or interprets the signal. The controller 42 then determines the appropriate movement (or lack of movement) required to position the at least one support member adjacent the article 30. The controller 42 then commands the actuator 36 to induce movement of the at least one support member 32, if required.

[0029] During operation of the multi-purpose holder assembly 28, the sensor 34 may be continually detecting conditions indicative of the multi-purpose holder

assembly 28 being in use, and the sensor 34 may operate in various modes in which varying conditions are detected. For example, the sensor 34 may operate in a non-use mode in which the sensor 34 detects only the presence or absence of the article 30 within the multi-purpose holder assembly 28. Once the presence of the article 30 is detected, the sensor 34 may begin operating in a use mode in which the sensor 34 detects conditions of the article 30, such as height or liquid level. The sensor 34 may also detect or continue to detect conditions indicative of the removal of the article 30 from the multi-purpose holder assembly 28. Once a condition is detected indicating that the article 30 is being removed or has been removed, the sensor 34 may generate a signal indicative of the removal, such that the actuator 36 may return the at least one support member 32 to the first position.

[0030] It will be appreciated that the sensor 34 and/or the controller 42 may include thresholds that the sensed condition readings must meet, exceed, or remain below in order to induce corresponding movement in the at least one support member 32. The thresholds could be implemented as requiring a time delay between sensor readings or requiring changes in sensed conditions to meet or exceed shock values, such as force as a function of time, to prevent undesirable movement of the at least one support member 32. For example, if the sensor 34 detects the force exerted by the article 30 on the multi-purpose holder assembly 28, the movement of the vehicle due vibration and to road hazards encountered during normal vehicle operation might temporarily lift the article 30 from the multi-purpose holder assembly 28 mimicking the removal of the article 30 from the multi-purpose holder assembly 28. It would be undesirable to allow the at least one support member 32 to retract to the first position after the article 30 has been merely jarred by vehicle movement. Thus, it may be desirable that the sensors 34 and/or the controller 42 be programmed or otherwise controlled to prevent the undesirable actuation of the actuator 36 and at least one support member 32.

[0031] The controller 42 receives and/or interprets the signal generated by the sensor 34 and determines the corresponding desired movement of the at least one support member 32. It will be appreciated that it may be desirable to move the at least

one support member 32 into engagement with the article 30, such that the at least one support member 32 contacts the article 30. It may alternatively be desirable to move the at least one support member 32 adjacent to the article 30, so that the at least one support member 32 is in close proximity to the article 30 but does not touch the article 30. It will be appreciated that as the article 30 moves during normal operation of the vehicle, the at least one support member 32 may contact the article 30, even if the at least one support member 32 is initially positioned adjacent the article 30. The controller 42 may be programmed to position the at least one support member 32 adjacent the article 30, such that the at least one support member 32 is or is not in contact with the article 30, as desired.

[0032] It will be appreciated that the multi-purpose holder assembly 28 may be disabled such that the at least one support member 32 remains in the first position, such that the at least one support member 32 is not movable to provide additional support to the article 30. In a preferred embodiment, a switch (not shown) may be provided to disable the multi-purpose holder assembly 28, although such is not required. In a more preferred embodiment, a switch (not shown) may be provided to reset the multi-purpose holder assembly 28, so that the at least one support member 32 returns to the first position, although such is not required.

[0033] Referring now to Fig. 5, there is illustrated a second embodiment of a multi-purpose holder assembly, indicated generally at 128, in accordance with the present invention. The multi-purpose holder assembly 128 is similar to the multi-purpose holder assembly 28 and only the components that differ will be described herein. Many of the components of the multi-purpose holder assembly 128 as illustrated in Fig. 5 are similar in structure and function to corresponding components of the multi-purpose assembly 28 as illustrated in Figs. 2 through 4. Therefore, such corresponding components are indicated by similar reference number in these Figures, but with the components of the multi-purpose holder assembly 128 as illustrated in Fig. 5 having the addition of 100 to each reference number.

[0034] An article 130 may be disposed within the multi-purpose holder assembly 128. The article 130 is illustrated in phantom in Fig. 5 alternatively as a larger

beverage holder or a smaller mobile phone, respectively. However, it will be appreciated that the article 130 may be any removable item such as a mobile phone, PDA, sunglasses, cigarette box, or portable media device, and have any shape.

[0035] At least one support member 132 is illustrated as a plurality of arm members that are movable horizontally and/or vertically through at least one opening 143 in a body 138. The at least one support member 132 may be movable by at least one actuator 136. As illustrated, the at least one actuator 136 includes a first actuator to facilitate vertical movement of the at least one support member 132 and a second actuator to facilitate horizontal movement of the at least one support member 132. However, it will be appreciated that the at least one actuator 136 any number of actuators for facilitating movement of the at least one support member 132 in any direction or multiple directions. The at least one opening 143 in the body 138 may be shaped to accommodate the movement of the at least one support member 132 so that the at least one support member 132 may be moved adjacent the article 130. It will be appreciated that the at least one opening 143 may also limit or prevent undesirable movement of the at least one support member 132.

[0036] A sensor assembly 134 is disposed within a portion of the body 138, although such is not required. The sensor assembly 134 is illustrated as a first pair of sensors 134a disposed within a recess 140 and a second plurality of sensors 134b disposed within each of the at least one support members 132. However, it will be appreciated that any number and arrangement of sensors may comprise the sensor 134. As illustrated, the sensors 134a, 134b are exposed directly to the article 130, although such is not required. The sensors 134a, 134b comprising the sensor assembly 134 may be located within a proximity to the article 130 when the article 130 is placed within the multi-purpose holder assembly 128 so that the sensor 134 may detect a desired condition of the article 130. Thus, it will be appreciated that the sensor assembly 134 may be located within the multi-purpose holder assembly 128 such that a portion of the multi-purpose holder assembly 128 is disposed between the sensor 134 and the article 130 when the article is disposed within the multi-purpose holder 128. Each of the sensors 134a, 134b comprising the sensor assembly 134 may

detect different conditions and/or characteristics of the article 130. For example, the first pair of sensors 134a may detect a condition of the article 130, such as liquid level and height. The second pair of sensors 134b may detect the presence and/or position of the article 130, such that the signal generated by the second plurality of sensors 134b may be used by the controller 142 to more precisely position the at least one support member 132 relative to the article 130. The signal or signals generated by the second plurality of sensors 134b may be used to position the at least one support member 132 to prevent undesirable contact between the at least one support member 132 and the article 130. For example, the signal generated by the second plurality of sensors 134b may be representative of the location of contact between the article 130 and the at least one support member 132. Once this signal is received, the controller 142 may slightly reposition or back off the at least one support member 132 to prevent undesirable contact, such as rubbing, between the at least one support member 132 and the article 130. However, it will be appreciated that the signal generated by the second plurality of sensors 134b may be used in any manner described throughout this application.

[0037] Referring now to Fig. 6, there is illustrated a third embodiment of a multi-purpose holder assembly, indicated generally at 228, in accordance with the present invention. The multi-purpose holder assembly 228 is similar to the multi-purpose holder assembly 28 and only the components that differ will be described herein. Many of the components of the multi-purpose holder assembly 228 as illustrated in Fig. 6 are similar in structure and function to corresponding components of the multi-purpose assembly 28 as illustrated in Figs. 2 through 4. Therefore, such corresponding components are indicated by similar reference number in these Figures, but with the components of the multi-purpose holder assembly 228 as illustrated in Fig. 6 having the addition of 200 to each reference number.

[0038] An article 230 may be disposed within the multi-purpose holder assembly 228. The article 230 is illustrated in phantom in Fig. 6 as a beverage holder. However, it will be appreciated that the article 230 may be any removable item such

as a mobile phone, PDA, sunglasses, cigarette box, or portable media, and have any shape.

[0039] At least one support member 232 is illustrated as an inflatable bladder disposed within an opening 243 within a body 238. The at least one support member 232 may not extend within a recess 240 in the body 238 in a deflated position, as shown in Fig. 6, although such is not required. The at least one support member 232 is inflatable from the deflated position to a plurality of inflated and partially inflated positions. The at least one support member 232 is illustrated in an inflated position in phantom in Fig. 6 in which the at least one support member 232 is inflated to be adjacent the article 230. In a preferred embodiment, the at least one support member 232 is formed of an elastomeric material.

[0040] Preferably, an actuator 236 is comprised of a valve assembly. The at least one support member 232 is communicably connected to the actuator 236, and the actuator 236 is communicably connected to a fluid source 258. The actuator 236 controls the flow of fluid from the fluid source 258 to the at least one support member 232 to manipulate the inflation of the at least one support member 232 and, correspondingly, the position of the at least one support member 232 relative to the article 230. The actuator 236 controls the flow of fluid from the fluid source 258 in response to commands from the controller 242 as described above for the previous embodiments.

[0041] As illustrated, a sensor 234 is disposed within a horizontal surface that is formed integral to a portion of the vehicle, although such is not required. It will be appreciated that the sensor 234 may be disposed within, on, or near any portion of the multi-purpose holder assembly 238. It will further be appreciated that any portion of the multi-purpose holder assembly 238 may be formed integral to any portion of the vehicle.

[0042] Referring now to Fig. 7, there is illustrated a fourth embodiment of a multi-purpose holder assembly, indicated generally at 328, in accordance with the present invention. The multi-purpose holder assembly 328 is similar to the multi-purpose holder assembly 28 and only the components that differ will be described herein.

Many of the components of the multi-purpose holder assembly 328 as illustrated in Fig. 7 are similar in structure and function to corresponding components of the multi-purpose assembly 28 as illustrated in Figs. 2 through 4. Therefore, such corresponding components are indicated by similar reference number in these Figures, but with the components of the multi-purpose holder assembly 328 as illustrated in Fig. 7 having the addition of 300 to each reference number.

[0043] At least one support member 332 is illustrated as a single pivotably mounted arm member. The at least one support member 332 is disposed within an opening 343 within a body 338. The at least one support member 332 is movable from the opening 343 to within a recess 340 within the body 338 to be positioned adjacent an article 330, as shown in phantom in Fig. 7.

[0044] A sensor 334 is disposed below a portion of the body 338. As illustrated, the sensor 334 has a circular cross-section such that the sensor 334 extends substantially across the horizontal portion of the recess 340 of the body 338. However, it will be appreciated that the sensor 334 may have any shape and cross-section and may or may not extend across a portion of the recess 340.

[0045] In accordance with the provisions of the patent statutes, the principle and mode of operation of this invention have been explained and illustrated in its preferred embodiment. However, it must be understood that this invention may be practiced otherwise than as specifically explained and illustrated without departing from its spirit or scope.